



Winter 2014

Aerocom: Winter 2014

John D. Odegard School of Aerospace Sciences

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WINTER 2014 | JOHN D. ODEGARD
SCHOOL OF AEROSPACE SCIENCES

AEROCOM





A MESSAGE FROM THE DEAN

On December 28th 2013 the headlines read; “North Dakota named as one of the six National Test Airspace Sites for Unmanned Aircraft.” This designation was made by the FAA after a fierce competition that included proposals from almost the entire United States. Being designated as a National Test Airspace Site is a huge step forward for the Odegard School’s Unmanned Aircraft Systems (UAS) program as it continues to be the leader in moving unmanned aircraft into commercial operations in the national airspace. This announcement heralds an incredibly bright future for UND, North Dakota and the nation.

It is amazing that this headline can be traced back to a single phone call I received from Senator Dorgan’s Chief of Staff in the summer of 2005. The call referenced the potential closing of Grand Forks Air Force Base and the role the Odegard School could play to keep it open. Understanding the role that UASs would play in the future of aviation and being able to align the capabilities of the Odegard School and the University of North Dakota not only kept the Base open but realigned its mission to include UASs. At the same time it launched the Odegard School into a leadership position in this exciting and emerging technology.

Clearly the recognition there would be a need for the transition of UASs from military to civilian and commercial applications and access into the national airspace would turn out to be profound, but also the opportunities it would provide for training, education, and research for every aspect of UASs was invaluable. This vision would lead to the creation of the Odegard School’s Center of Excellence (COE) for UASs.

Over the course of its past eight years the UAS COE has leveraged the capabilities of the Odegard School to obtain over \$50 million in funding from the FAA, Department of Defense, the State of North Dakota, private industry and private benefactors. These funds have stimulated collaborations benefitting other colleges at UND, North Dakota State University, and other state entities and businesses as partners.

Seizing the opportunity provided by that first phone call has led to the Odegard School and UND becoming the first University to offer a Bachelor of Science Degree in UASs, the first private-sector user of a Predator UAS training system, and the first to establish a UAS Research Compliance Committee. Now, with this test site designation, we have achieved the next step by becoming the first to develop and leverage a test site which will open the doors to flying UASs in the national airspace.

Our past is historic, our present is impressive and our future is breathtaking. Unmanned Aircraft Systems will become the dominate choice for all airborne missions except passenger travel and general aviation. The investments we have made in UAS technology will continue to attract private industry and ensure the growth in our research and training programs through future grants and contracts. In all of these cases, the National Test Airspace designation ideally positions the Odegard School at the leading edge of UAS development and applications and provides another testament to our reputation as one of the pre-eminent aerospace colleges in the world.

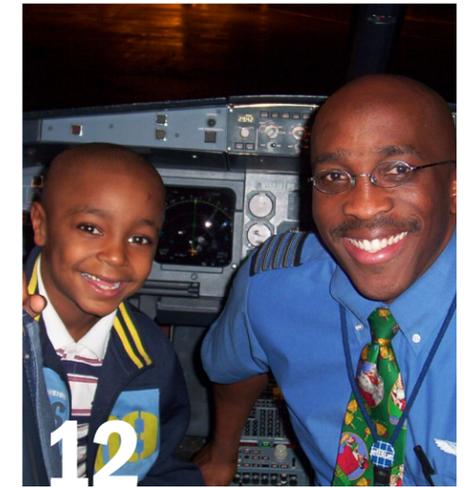
Bruce A. Smith | Dean, John D. Odegard School of Aerospace Sciences



04



08



12

CONTENTS

AEROCOM

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Cover Image
North Dakota Representative Kevin Cramer, Senator Heidi Heitkamp, Senator John Hoeven, and Lieutenant Governor Drew Wrigley at the announcement of North Dakota's designation as a UAS Test Site.

Full article on page 4

Photo Credit
Jackie Lorentz

04 North Dakota is One of Six Sites Selected for FAA-Approved UAS Research

UND Aerospace UAS Center expected to play big role in national R&D program to advance UAS use

08 UND NDX Spacesuit Team Showcased in Global Test Program

Tests were a part of an ongoing quest to prepare for a human expedition to Mars

12 Eric Scott Helps a Youngster Pilot His Dreams

14 Measuring Rarified Air

UND's Cessna Citation research jet testing new sensor for private industry partner

16 AeroNews

18 Aerospace Alumni Advisory Board Update

19 Upcoming Events

NORTH DAKOTA IS ONE OF SIX SITES SELECTED FOR FAA-APPROVED UAS RESEARCH

UND Aerospace UAS Center expected to play big role in national R&D program to advance UAS use

By Juan Miguel Pedraza | Photography By Jackie Lorentz

The Federal Aviation Administration (FAA) announced Dec. 30 last year that six sites won the exclusive right to conduct research and testing on unmanned aircraft systems (UAS). The North Dakota Department of Commerce had one of six successful proposals—out of 25 proposals submitted—for this opportunity with broad national and global implications.

FAA Administrator Michael Huerta, during a media briefing announcing the decision, said he expected to get all six sites (including North Dakota) fully engaged in their testing programs—complete with FAA Certificates of Authorization, which allow UAS to be operated in designated airspace—as soon as possible, with the first one online no later than 180 days from the date of the announcement.

The University of North Dakota (UND)—with its multifaceted UAS research, testing, education, and training programs—is a key player in this national effort.

“We are looking forward to a productive and long-term collaboration, and we thank the many people who made this possible—the Governor and Lieutenant Governor, the current and past members of our North Dakota Congressional delegation, the North Dakota Legislature, the City of Grand Forks and the Grand Forks Air Force Base, as well as our partners at North Dakota State University, Lake Region State College, and Northland Community and Technical College,” said UND President Robert Kelley. “Together, we form a unique partnership that is essential to this undertaking.”

UND has been a key leader in UAS research and development, teaching and testing.

Bruce Smith, Dean of the UND John D. Odegard School of Aerospace Sciences, said, “As the first university to offer a UAS degree, the first private-sector user of a Predator drone training system and the home of the country’s first UAS Research Compliance Committee, UND is committed to the cutting edge of UAS technology. This announcement heralds an incredibly bright future for UND, North Dakota and the nation.”



In a press conference held at UND following the FAA announcement, Sen. John Hoeven, R-N.D., underscored the importance of the federal UAS decision.

"This is a great way to start the new year!" said Hoeven, who as governor of North Dakota facilitated the launch of UND's UAS Center of Excellence.



"This is about the future of aviation, and it was critical that we got this designation," added Hoeven, praising his congressional teammates Sen. Heidi Heitkamp and Rep. Kevin Cramer, who also made brief remarks during the press conference. Hoeven acknowledged the efforts of many people in the region's growing UAS effort, including Bob Becklund, head of the Northern Plains Unmanned Aircraft Systems Authority; Klaus Thiessen, president and CEO of Grand Forks Region Economic Development Corporation; Grand Forks Mayor Mike Brown; Anne Temte, president, Northland Community and Technical College, and Doug Darling, president, Lake Region State College, as well as many past and current personnel at UND and North Dakota State University.

North Dakota Lt. Gov. Drew Wrigley said in his remarks at the press conference that UND is a globally recognized aviation leader that is also now known as a top player in UAS.

"UAS is the fastest growing component in aviation," he said. With this development in UAS, "the pioneering spirit is alive and well in North Dakota. UAS will be the going concern for the next 100 years."

Sen. Heidi Heitkamp, D-N.D., re-emphasized during her remarks that the FAA's announcement was a major event

for North Dakota and the region.

"We can be the Silicon Valley of this technology," she said. "We got it not because of political power but because of the merits of the proposal, the quality of the application. We can all celebrate this amazing milestone."

Rep. Kevin Cramer, R-N.D., praised the teamwork involved within North Dakota and within the state's congressional delegation for this accomplishment.

"It's really quite unique, quite special," said Cramer, former director of North Dakota Economic Development & Finance. Cramer also applauded efforts in Minnesota, specifically at Northland Community and Technical College in East Grand Forks and Thief River Falls, to show support for UAS research and training across state lines. Northland and UND have agreements in place to work together on various facets of UAS research.

The FAA's selection process reviewed 25 competitive applications from 24 states. In selecting the six test site operators, the FAA considered geography, climate, location of ground infrastructure, research needs, airspace use, safety, aviation experience and risk. In totality, these six designated test sites reflect cross-country geographic and climatic diversity and help the FAA meet its UAS research needs.

The test sites are expected to generate significant economic development associated with high-tech jobs and investments.

"These test sites will give us valuable information about how best to ensure the safe introduction of this advanced technology into our nation's skies," Transportation Secretary Anthony Foxx said in a statement.

According to the FAA's announcement, the North Dakota Department of Commerce plans to develop UAS airworthiness essential data and validate high reliability link technology. The FAA announcement said, "This applicant will also conduct human factors research. North Dakota's application was the only one to offer a test range in the Temperate (continental) climate zone and included a variety of different airspace which will benefit multiple users."

North Dakota—especially the University of North Dakota's Center for Unmanned Aircraft Systems Research, Education and Training—have been internationally at the forefront of UAS development both in terms of research and training. Among other recent developments, the U.S. Air Force announced that it will sign a lease with Grand

Forks County to establish a UAS tech park at the Grand Forks Air Force Base.

"We've said all along that Grand Forks is an ideal location to test UAS integration, and now the FAA has agreed with us," said Hoeven in a statement. "This test site designation, combined with Grand Sky, the Grand Forks region's new aerospace technology and business complex on Grand Forks Air Force Base, is tremendously important and enables the entire region to advance the work it has been doing to become the premier northern hub for unmanned aerial systems."

At the press conference, Wrigley emphasized the state's support for a test site, including Governor Jack Dalrymple's recommendation and the North Dakota State Legislature's appropriation of \$5 million toward development efforts. Wrigley also highlighted North Dakota's history of progress in UAS education, research and development, including the University of North Dakota being the first institution in the nation to award degrees in UAS operations. The state also is ideal for a national test site because of its climate diversity and open terrain, as well as its proven aviation and aerospace partnerships between industry, education and government, Wrigley said.

Governor Dalrymple's recent executive order established the Northern Plains Unmanned Systems Authority, a six-member commission chaired by Wrigley to advance North Dakota's UAS opportunities. Representatives from the state's general aviation industry, University of North Dakota Aerospace, North Dakota Aeronautics Commission, North Dakota Department of Commerce, and Office of the Adjutant General all serve on the commission, which provides oversight of the newly designated UAS test site.

In a related development last year, Al Palmer, director of the UND UAS Center, was appointed to serve on the North Dakota Airspace Integration Team. This team will be the interface between the state and the Federal Aviation Administration (FAA) on UAS integration into the National Airspace System (NAS).



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UND NDX SPACESUIT TEAM SHOWCASED IN GLOBAL TEST PROGRAM

Tests were a part of an ongoing quest to prepare for a human expedition to Mars

By Juan Miguel Pedraza | Photography By Jackie Lorentz

The UND NDX planetary exploration system was invited to participate in an international test series dubbed "World Space Walk 2013." The test series took place earlier in October as a highlight of World Space Week 2013, which was themed "Exploring Mars, Discovering Earth."

"It was certainly a great honor to work with an international team on this project," said Pablo de León, an aerospace engineer and faculty member in the Department of Space Studies, part of the John D. Odegard School of Aerospace Sciences. De León is director of the UND Human Spaceflight Lab, which is the home of the NDX planetary exploration system, including several spacesuits, a rover and an inflatable habitat.

The tests were designed and led by the Austrian Space Forum, which also provided the mission control center for the test campaign. The spacesuit experiments were carried out in Austria, North Dakota and Utah, with additional support from France. One of the key elements of equipment for a future human expedition to Mars will be a spacesuit that allows astronauts to roam the Martian surface. For the first time, three Mars analog suit development teams—including UND Space Studies' NDX team—performed simultaneous experiments, coordinated from a single mission control center.

The experiments are a first step in developing a universal standard for comparing Mars analog suits in terms of the impact they have on the agility and dexterity of the suit wearers.

"We were able to integrate our systems easily and work cooperatively on a scientifically valuable project, learning a lot from each other," said de León. "This test series once again showed that space, and in particular the human exploration of Mars, should be an international venture where we can all benefit from each other's expertise."

De León, who spent many years in industry working on spacesuit design, says UND is uniquely qualified to work on analog simulations for lunar and Mars missions.

"We developed the research infrastructure to simulate an entire planetary base scenario, and it puts us in the forefront of lunar and Mars mission planning," said de León, whose student team is preparing a new UND NDX spacesuit exhibit for the North Dakota Historical Society's museum in Bismarck. "I can foresee that we will be doing a lot of testing in the coming years and working with the National Aeronautics and Space Administration—which has funded a lot of our work—and with the space industry and international partners to make these missions a reality."

NDX AT SMITHSONIAN

By Juan Miguel Pedraza

The University of North Dakota's NDX-1, a planetary exploration or "space" suit, was on display last summer at the Smithsonian National Air and Space Museum in Washington, one of the world's largest and most frequented museums. The UND display was part of Smithsonian's "Suited for Space" exhibit. The exhibit was organized by the Smithsonian Institution Traveling Exhibition Service (SITES) and appeared at numerous locations across the country. It made its original appearance at the Museum of Science and Industry in Chicago in April 2011 and explores the evolution of spacesuit development from the early twentieth century until the beginning of the space shuttle era.

"It is just a poster of our suit in the display, but it's very important that we are present in that highly regarded exhibit and place, along with Apollo, Gemini and Mercury historical space suits," said UND Space Studies research faculty member Pablo de León, an aeronautical engineer who designed and, with a student team, built and tested

the NDX-1 system. De León is now at work on the NDX-2 system, which includes a suit, a rover, and a habitat—all designed for the inhospitable environments of other planets. The Space Studies Department is part of the UND John D. Odegard School of Aerospace Sciences; the department celebrated its 25th anniversary this year.

According to the Smithsonian National Air and Space Museum website, the Suited for Space exhibition reveals the remarkable creativity and ingenuity of nearly a century of flight and spacesuit design and development. Through rare and original photography, including unique new x-ray images of spacesuit interiors, the exhibition reveals how the modern technological marvel that is the spacesuit enables astronauts to live and work in space.



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UND SPACE STUDIES STUDENT TEAM SUCCESSFULLY COMPLETES 10 DAY "LUNAR" MISSION

By Juan Miguel Pedraza | Photography By Jackie Lorentz

Three University of North Dakota graduate students have successfully completed a 10-day mission in UNDs Inflatable Lunar/Mars Habitat (ILMH). Tim Buli, Space Studies; Erica Donlinar, Atmospheric Sciences; and Travis Nelson, Space Studies, completed the ILMH mission last fall with the help of a student support team. Pablo De Leon, UND Space Studies faculty member and director of the UND Human Spaceflight Lab, served as the mission chief. The ILMH mission was supported and closely followed by the National Aeronautics and Space Administration (NASA) and included experiments conducted for the Jet Propulsion Laboratory.

The all-volunteer student crew and their simulated lunar mission were part of the UND Space Studies North Dakota Planetary Exploration Initiative. The student crew spent 10 days in the specially constructed Inflatable Lunar/Mars Habitat on a simulated mission, living inside the pressurized inflatable habitat as part of a trial funded by NASA. During the mission, the crew donned the NDX-2 planetary exploration suit—designed and built on campus by a crew that included UND faculty, students, and staff from several departments—and driving an electrically powered moon rover.

The trial included tests of the habitat's life support and other engineering systems.

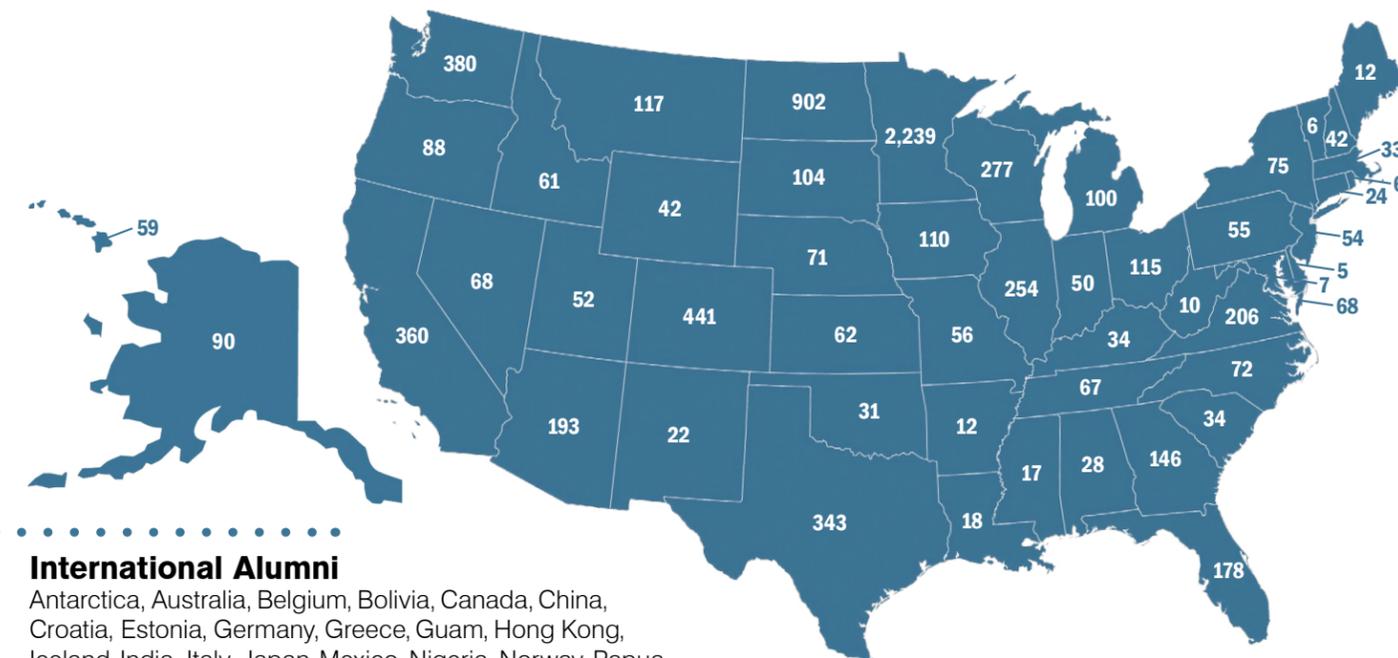
Researchers also designed the trial to see how well the system, including the habitat, rover, spacesuits and airlocks work together. This trial was a prelude to a much longer trial scheduled for spring 2014.

De León says it's likely that UND will be testing and working a lot more with NASA as well as with the space industry and international partners to make lunar and Mars missions a reality. De León, a native of Argentina, is an aerospace engineer and director of UND's Human Spaceflight Laboratory. He says UND is uniquely qualified for the work ahead.

AlumniProfile

Find Odegard School alumni across the globe

Numbers represent alumni living in each state



International Alumni

Antarctica, Australia, Belgium, Bolivia, Canada, China, Croatia, Estonia, Germany, Greece, Guam, Hong Kong, Iceland, India, Italy, Japan, Mexico, Nigeria, Norway, Papua New Guinea, Puerto Rico, Saudi Arabia, St Lucia, Sweden, Switzerland, Taiwan, Thailand, Turkey, United Kingdom

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ERIC SCOTT HELPS A YOUNGSTER *pilot his dreams*



JetBlue's CEO, Dave Barger, welcomed Elijah Hedrington to Terminal 5 for a reunion with mentors First Officer Jovan O'Bryant and Captain Eric Scott.

By Juan Miguel Pedraza | Photography Courtesy of JetBlue

In a story that made headlines recently in several East Coast media, JetBlue captain Eric Scott, a UND Aerospace alum, linked up with high school student Elijah Hedrington. Scott first met Elijah when he was just five years old and on one of Scott's flights. The pilot invited him into the cockpit, and, Elijah says, that's when he decided that he, too, would learn to fly.

JetBlue recently arranged for the two to be reunited at John F. Kennedy International Airport, where their bond began. Scott is mentoring Elijah, who started his sophomore year at Bronx Aerospace High School last fall. When he graduates, Elijah plans to study neurology and aviation.

MEASURING THE RARIFIED AIR

UND's Cessna Citation research jet testing new sensor for private industry partner

By Kate Menzies, UND Public Affairs
Photography by Kirk Peterson



With an operating ceiling of more than 43,000 feet, the University of North Dakota's Cessna Citation II research jet can really soar. Having the ability to fly about 10,000 feet higher than commercial airlines typically fly, the Citation has an up-close look at the clouds and the physics behind them.

When private industry partner Ophir Corp., a Colorado-based subcontractor to major U.S. aerospace corporations, wanted to test its Optical Air Data Sensor, the company came to UND Aerospace—UND is the only public university that owns and operates a research jet.

"If you want to test or develop an instrument, the Cessna serves as a platform," said Dr. David Delene, a UND Atmospheric Sciences faculty member who specializes in atmospheric research. Department chair Mike Poellot is the principle investigator for the aircraft, which is equipped with customized instruments used to measure atmospheric properties.

Ophir's Optical Air Data Sensor was installed in UND's Citation last summer and tested over a targeted range of conditions in a series of dedicated flights. The Optical Air Data Sensor uses laser beam reflections from particles to characterize the air flow around the aircraft. The sensor measures airflow in three dimensions approximately a meter away from the aircraft. At the same time, the Citation measures atmospheric winds, temperature, pressure, true air speed, angle of attack and angle of sideslip.

This sensor will be advantageous to commercial as well as military aircraft by being able to produce accurate data in poor weather conditions.

Companies such as Ophir fund testing aboard UND's specialized research jet to try out their instruments; UND provides the aircraft and crew, flies with the prototype or test instruments, provides high-quality atmospheric measurements and does post-flight analysis.

UND's Cessna Citation II aircraft also measures aerosols and state-of-the-atmosphere conditions over the range of flight conditions typically encountered by commercial and general aviation aircraft. Although the jet does sample aerosols from storm clouds, it does not fly through any conditions a commercial aircraft won't fly through.

Instrument testing takes place year-round and all over the world. Students in the UND Atmospheric Sciences program have the ability to ride in the jet and observe first-hand how instruments are tested.

UND Atmospheric Sciences has operated a research jet capability since the early 1970's to provide top-notch research opportunities for companies and students.

Emergency Responders From Around The Valley Get High Tech UAS Training at UND

Emergency responders from around the Valley got some high tech training last summer, learning the basics of operating the DraganFlyer. Some SWAT teams are now using this small, unmanned aircraft system. UND Aerospace trained 17 law enforcement officers and firefighters from eastern North Dakota and Northwestern Minnesota how the DraganFlyer can be used in their agencies. UND Aerospace is the North American training center for the DraganFlyer, which has a price tag starting at \$25,000 dollars and has all kinds of uses for different agencies. For

instance: Its infrared, heat-finding camera could be used to find a lost child in winter. Fire fighters could use it to plan their attack on a major fire or chemical spill.

Alan Frazier, UND Aerospace: "That's the poster child of unmanned aircraft... that we would put it where we would not want to put a live pilot, as well as the fact that it's very affordable, much more affordable than using a manned airplane."

Bruce Smith, Dean of UND Aerospace: "The uses are unlimited. Anything

that you can think of could have an application for unmanned aircraft, except at this point for passenger travel."



UND Aviation, Business alum earns DFC

A daring nighttime rescue mission over Libya earned UND Aerospace alum Capt. Domenic John Easton, a native of Helena, MT, a Distinguished Flying Cross, bestowed for "heroism or extraordinary achievement while participating in an aerial flight." According to a release from Elgin Air Force Base, Easton was on a battle mission in Libya in 2011 that resulted in the loss of an aircraft and ejection of the flight team, the pilot into the sea and the weapons officer

into friendly hands on land. Easton, from his aircraft, then coordinated and escorted the successful efforts to rescue the pilot. The release mentions Easton's education at UND, with degrees in business and aeronautics.

UND AEROBATIC TEAM RACKS UP MORE WINS



By Juan Pedraza
Photography by Jackie Lorentz

The UND Aerobatic Team returned from the IAC US National Championships last September with a handful of trophies, extending by another year an enviable record of wins.

"The UND Aerobatic Team did an excellent job representing UND with students individually ranking extremely well against the professionals," said team leader and coach, Mike Lents, who also is a senior flight instructor.

Student William Sullivan took first place in the Primary Category, an excellent finish to his first season competing. Also competing in the Primary Category were students Rosemary Coe, Amelia Gagnon, Jonathan Sievert and Jennifer Slack. Student Cameron Jaxheimer finished the contest in Third Place in the Sportsman Category, an amazing feat of airmanship in a very strong and competitive field. Student Andrew Davidsmeyer finished 20th. Coach Jonathan Sepulveda finished 13th, also in the Sportsman Category. Coaches Michael Lents and Greg Gilmer competed in the Intermediate Category placing 7th and 16th overall, respectively.

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